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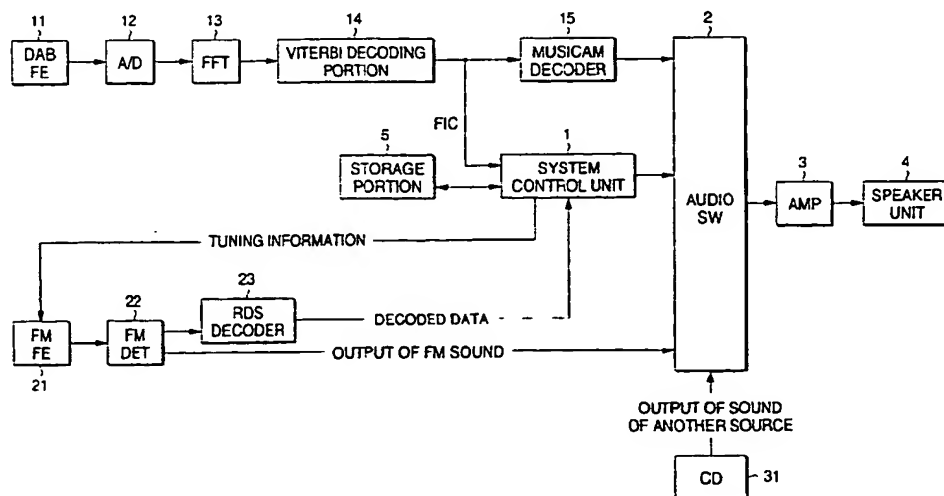
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(54) Broadcast receiver comprising both a receiver for Digital Audio Broadcasts as well as an FM broadcast receiver with a Radio Data System decoder

(57) A digital-broadcast receiving system incorporating: an FM receiving portion including an RDS decoder for receiving an RDS broadcast; a DAB receiving portion for receiving a digital audio broadcast; priority-order determining means for determining a priority order which is given to the RDS broadcast or the digital audio broadcast; instruction means for instructing listening of

a specific program which is broadcast by the RDS broadcast and the digital audio broadcast; and a control unit for giving priority to the specific program which is broadcast by the broadcast given a high priority order in accordance with a result of instruction made by the instruction means and the priority order so that the specific program is output.

FIG. 1



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Description

[0001] The present invention relates to a digital-broadcast receiving system, and more particularly to a receiving system for receiving at least a digital audio broadcast (hereinafter called "DAB") which is at the practical phase in Europe.

[0002] As a system for transmitting broadcasting waves including data signals including digital audio signals and formed into a predetermined format and receiving the broadcasting waves, the DAB system abided by the Europe Standard (Eureka 147) is available. In the DAB, one ensemble is composed of a plurality of services. Each service is composed of a plurality of components, such as English and German.

[0003] Fig. 3 shows an example of the structure of services of the DAB system, in which a state of linking among services (three in this case) and components (six in this case) constituting an ensemble 1 and an OFDM signal transmitted from a DAB station is shown.

[0004] The OFDM signal transmitted from the DAB station includes FIC (Fast Information Channel) and MSC (Main Service Channel).

[0005] Sub-channels (SubChO to 63) constituting the MSC has the correspondence with the foregoing components. The FIC includes information about the services which can be used by the ensemble and information indicating the link among the services, components and sub-channels.

[0006] Therefore, the DAB enables information about the plural services and components included in an ensemble to be obtained if a certain ensemble can be received. Therefore, instantaneous switching to a different service or a component is permitted without a necessity of changing the frequency.

[0007] As one of methods of using the DAB receiver for receiving the foregoing broadcast, an interruption receiving function into a specific program of, for example, traffic information is available. The foregoing function will now be described. In the DAB, information indicating whether or not the service which is being received supports a specific program, such as traffic information or emergency information, and information indicating a fact that a program is being broadcast can be included in a variety of information data items included in the FIC. In the DAB, alarm, road traffic flash and news flash are defined as the specific programs.

[0008] When a receiver has an operating means for turning on/off a function for priority-receiving the specific program and a user sets the receiver to execute the function for performing the priority-receiving function, the receiver determines start of the specific program in the service which is being selected in accordance with an ASW (Announcement Switching) flag in the FIC. Thus, an interruption process is executed with which the foregoing broadcast is given priority to be reproduced from a speaker unit in place of the source (for example, CD) which is being reproduced.

[0009] Information for realizing the foregoing interruption function is as well as employed in the RDS (Radio Data System). An RDS receiver uses a TP flag indicating whether or not traffic information is supported and a TA flag indicating start and end of traffic information are used to realize the interruption function.

[0010] Therefore, a receiving system incorporating an FM receiver having an RDS decoder and a DAB receiver enables each receiver to independently determine start of the specific program. Thus, control can be performed such that when an instructed program has been started in either of the receivers, reproduced sound from the receiver is given priority so as to be output from the speaker unit.

[0011] When the same program is simultaneously started by the FM broadcast and the DAB broadcast, the foregoing receiving system encounters a problem in that the broadcast for receiving the program must be determined. The sound quality is considerably different between the FM broadcast and the DAB broadcast and the DAB broadcast exhibits superior sound quality. Therefore, it is not preferable that a simple control method is employed with which the broadcast in which start of the program has been detected is reproduced.

[0012] Since a consideration can be made that the DAB broadcast takes a longer time to perform an encoding operation as compared with the FM broadcast, there is a possibility that the FM broadcast is first detected. Thus, there arises a problem in that reproduced sound of the FM broadcast is undesirably reproduced from the speaker unit though the same program is being broadcast by the DAB broadcast exhibiting superior sound quality.

[0013] If control is performed such that the interruption control function for only the DAB broadcast is turned on, the foregoing problem can be prevented. Another problem, however, arises in that interruption of the specific program which is being broadcast by the FM broadcast cannot be performed.

[0014] Accordingly, an object of the present invention is to provide a receiving system which is capable of reliably selecting a DAB broadcast if broadcasting of a specific program has been started on an FM broadcast and the DAB broadcast.

[0015] Another object of the present invention is to provide a receiving system which permits reliable interruption if a specific program is broadcast by either of broadcasts.

[0016] According to one aspect of the present invention, there is provided a digital-broadcast receiving system comprising: an FM receiving portion including an RDS decoder for receiving an RDS broadcast; a DAB receiving portion for receiving a digital audio broadcast; priority-order determining means for determining a priority order which is given to the RDS broadcast or the digital audio broadcast; instruction means for instructing listening of a specific program which is broadcast by the RDS broadcast and the digital audio broadcast; and a

control unit for giving priority to the specific program which is broadcast by the broadcast given a high priority order in accordance with a result of instruction made by the instruction means and the priority order so that the specific program is output.

[0017] According to another aspect of the present invention, there is provided a digital-broadcast receiving system having a structure as set forth in the one aspect of the invention, wherein the control unit determines whether or not the specific program can be received by the broadcast given the high priority order, and only when the specific program cannot be received, the control unit determines whether or not the specific program can be received by the broadcast having a low priority order.

[0018] According to still another aspect of the present invention, there is provided a digital-broadcast receiving system having a structure as set forth in the another aspect of the invention, wherein the control unit determines to start the specific program when the specific program can be received.

[0019] In the drawings:

Fig. 1 is a block diagram showing a digital-broadcast receiving system according to an embodiment of the present invention;

Fig. 2 is a flow chart which is executed by a system control unit 1; and

Fig. 3 shows an example of services of a DAB system.

[0020] An embodiment of the present invention will now be described with reference to the drawings. Fig. 1 is a block diagram showing a digital-broadcast receiving system incorporate an RDS receiving portion according to the embodiment of the present invention. The receiving system incorporates a DAB receiving portion for receiving a digital broadcast, an FM receiving portion for receiving an RDS broadcast, a system control unit 1, a switching portion 2, an amplifier 3, a speaker unit 4, a storage portion 5 and a CD player 31.

[0021] The DAB receiving portion includes a DAB-FE (a DAB front end) 11 for controlling synchronization with a DAB station; an A/D converter for converting a received analog signal into a digital signal; an FFT (Fast Fourier Transform) portion 13 for demodulating an OFDM wave; a Viterbi decoding portion 14 for correcting an error; and an audio decoder (Musicam Decoder) 15 for restoring compressed audio data (Musicam Data) to original audio data. Since the above-mentioned structure is a known fact disclosed in documents, the foregoing structure is omitted from description.

[0022] The FM receiving portion incorporates an FM-FE (an FM front end) 21 for controlling synchronization with an FM station; an FM-wave detector 22 for amplifying an intermediate-frequency (IF) signal to detect a composite signal from the foregoing signal; and an RDS decoder 23 for extracting an RDS signal from the com-

posite signal to demodulate the RDS signal. Also the above-mentioned structure is a known fact disclosed in documents, the foregoing structure is omitted from description. Moreover, the RDS decoder 23 outputs decoded data to the system control unit 1.

[0023] The system control unit 1 controls the DAB receiving portion and the FM receiving portion. Moreover, the system control unit 1 reads FIC information supplied from the DAB receiving portion to store various information data items included in data above in the storage portion 5. Information to be stored includes information about the services which can be used by the ensemble, information about linking among the services, components and sub-channels, information about FM stations (PI code information and FI (Frequency Information) list information), Asu (Announcement support) information indicating whether or not specific programs are supported and Asw information which is information for determining start of a specific program.

[0024] Moreover, the system control unit 1 controls the switching portion 2. The basic control is performed such that when start of the specific program on the DAB broadcast has been detected, sound reproduced from the DAB receiving portion is selectively output if another source, such as a CD, is being selected. When start of the specific program on the FM broadcast has been detected, sound reproduced from the FM receiving portion is selectively output. Output reproduced sound is amplified by the amplifier 3 so as to be output through the speaker unit 4. The digital-broadcast receiving system has the above-mentioned schematic structure.

[0025] The operation of the system control unit 1 according to the present invention will now be described. Fig. 2 is a flow chart of a priority interruption to the specific program. Note that the foregoing flow chart is periodically executed when an instruction to turn on the interruption function to the specific program has been issued from a user.

[0026] When an instruction to turn on the interruption function to the specific program has been issued from the user, the system control unit 1 determines that the priority order is given to the DAB or the RDS.

[0027] When the priority order is given to the RDS, whether or not the RDS broadcast supports the specific program is determined (step S2). Specifically, the TP code of the RDS station which is being received is determined so that the foregoing determination is made. Note that the priority order is given to the DAB in an initial stage. The priority order may be given to the RDS by operating the operation portion.

[0028] When the RDS broadcast supports the specific program, whether or not the specific program has been started on the RDS broadcast is determined (step S3). Specifically, the TA code of the RDS station which is being received is determined so that the foregoing determination is performed.

[0029] When start of the specific program on the RDS broadcast has been detected, a switching signal is out-

put to the switching portion 2 so as to output reproduced sound from the RDS receiving portion (step S4).

[0030] As a result, the so-called interruption receiving operation is performed such that reproduced sound from the FM receiver is given priority to be selected though, for example, sound reproduced from the CD player 31 has been selected by the switching portion 2.

[0031] If start of the specific program on the RDS broadcast is not detected at present in step S3, the current process is completed.

[0032] If a determination is made in step S1 that the priority order has been given to the DAB, a process conversing to step S2 is performed to determine whether or not the instructed specific program is supported by the DAB broadcast (step S5). Specifically, the foregoing determination is performed in accordance with Asu information in received FIC data.

[0033] When the DAB broadcast supports the specific program, whether or not the specific program has been started on the DAB broadcast is determined (step S6). The foregoing determination can be performed in accordance with Asw information in received FIC data.

[0034] When start of the specific program on the DAB broadcast has been detected, a switching signal is output to the switching portion 2 to select sound of the corresponding program so as to output sound through the speaker unit 4 (step S7). Thus, the interruption receiving operation is performed.

[0035] The characteristic portion of the present invention will now be described. If a determination is made in step S2 that the RDS broadcast does not support the specific program, the operation is shifted to step S9 so that whether or not the DAB broadcast supports the specific program is determined. If the DAB broadcast supports the specific program, whether or not the specific program has been started on the DAB broadcast is determined (step S6). If a determination is made in step S5 that the DAB broadcast does not support the specific program, the operation is shifted to step S8 to determine whether or not the RDS broadcast supports the specific program. If the RDS broadcast supports the specific program, the operation is shifted to step S3 so that whether or not the specific program has been started on the RDS broadcast is determined.

[0036] Therefore, the broadcast having the lower priority order is considered only when a determination is made that the upper broadcast does not support the specific program. Thus, if previous setting is performed such that the priority order is given to the DAB broadcast, the RDS broadcast is not considered as far as the DAB broadcast supports the specific program. Therefore, if the RDS broadcast starts broadcasting the specific program simultaneously or slightly earlier, the DAB broadcast can always be listened. If the specific program is broadcast on only either of the broadcasts, interruption can reliably be performed.

[0037] Although the foregoing embodiment has been described about the structure that interruption of traffic

information is performed, the present invention is not limited to the foregoing structure. A similar process can be performed if interruption of another program, such as news, is performed. In the foregoing case, the RDS broadcast has a structure that a code corresponding to the TP code is not assigned to the programs except for traffic information. Therefore, control from which step S2 shown in Fig. 2 is omitted is performed.

[0038] In the foregoing embodiment, the instructed specific program is the same program (traffic information) for the DAB broadcast and the RDS broadcast. The present invention is not limited to the foregoing structure. If a plurality of programs are instructed and an instructed news program has been started on the DAB broadcast and instructed traffic information program has been started on the RDS broadcast, priority can be given to the DAB broadcast.

[0039] As described above, according to the present invention, reproduced sound of a broadcast wave given high priority can always be listened in a case a specific program has simultaneously been started on a plurality of broadcast waves.

Claims

1. A digital-broadcast receiving system comprising:

an FM receiving portion including an RDS decoder for receiving an RDS broadcast;
a DAB receiving portion for receiving a digital audio broadcast;
priority-order determining means for determining a priority order which is given to the RDS broadcast or the digital audio broadcast;
instruction means for instructing listening of a specific program which is broadcast by the RDS broadcast and the digital audio broadcast; and
a control unit for giving priority to the specific program which is broadcast by the broadcast given a high priority order in accordance with a result of instruction made by said instruction means and the priority order so that the specific program is output.

2. A digital-broadcast receiving system according to claim 1, wherein the control unit determines whether or not the specific program can be received by the broadcast given the high priority order, and only when the specific program cannot be received, the control unit determines whether or not the specific program can be received by the broadcast having a low priority order.

3. A digital-broadcast receiving system according to claim 2, wherein the control unit determines to start the specific program when the specific program can

be received.

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FIG. 1

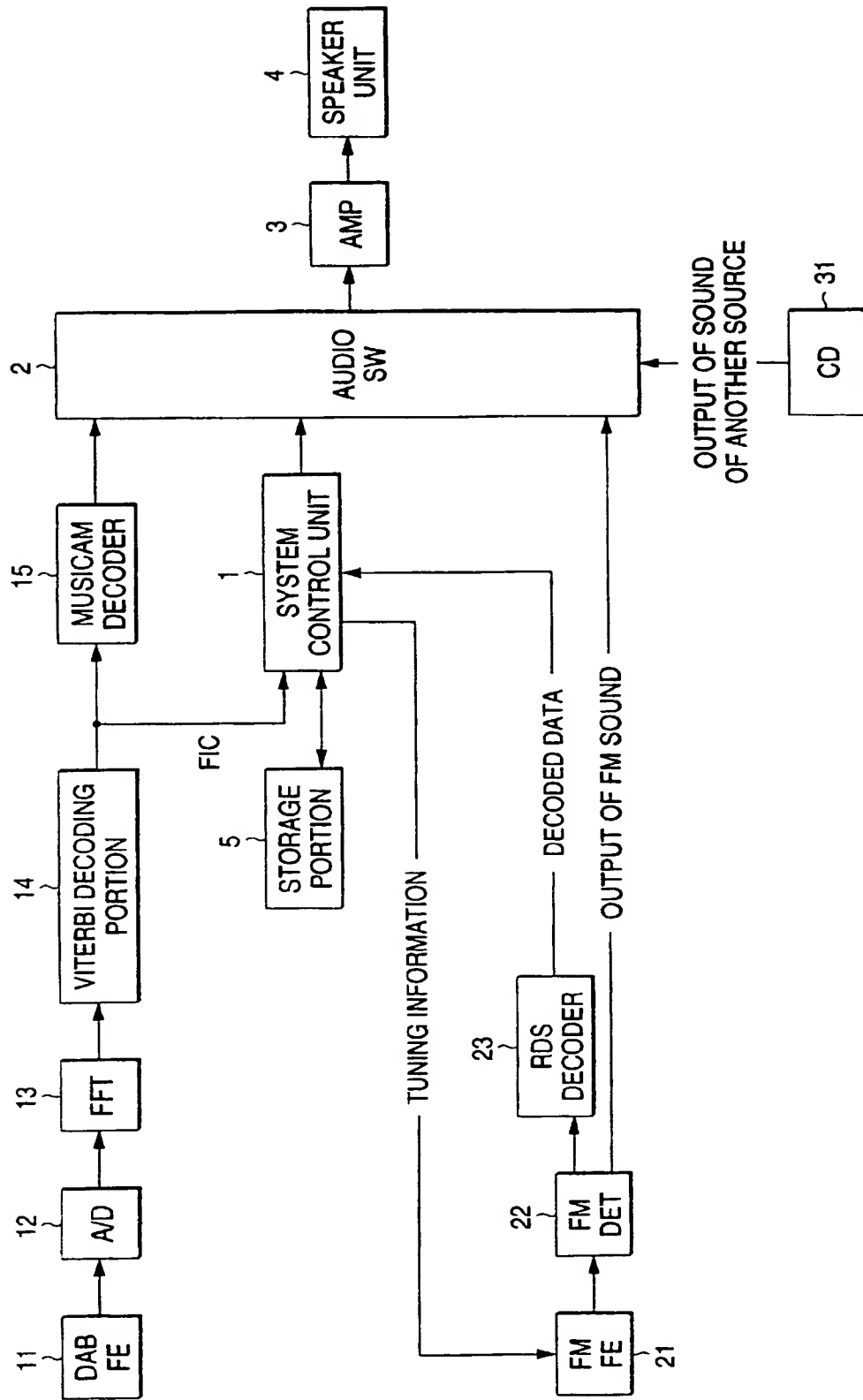


FIG. 2

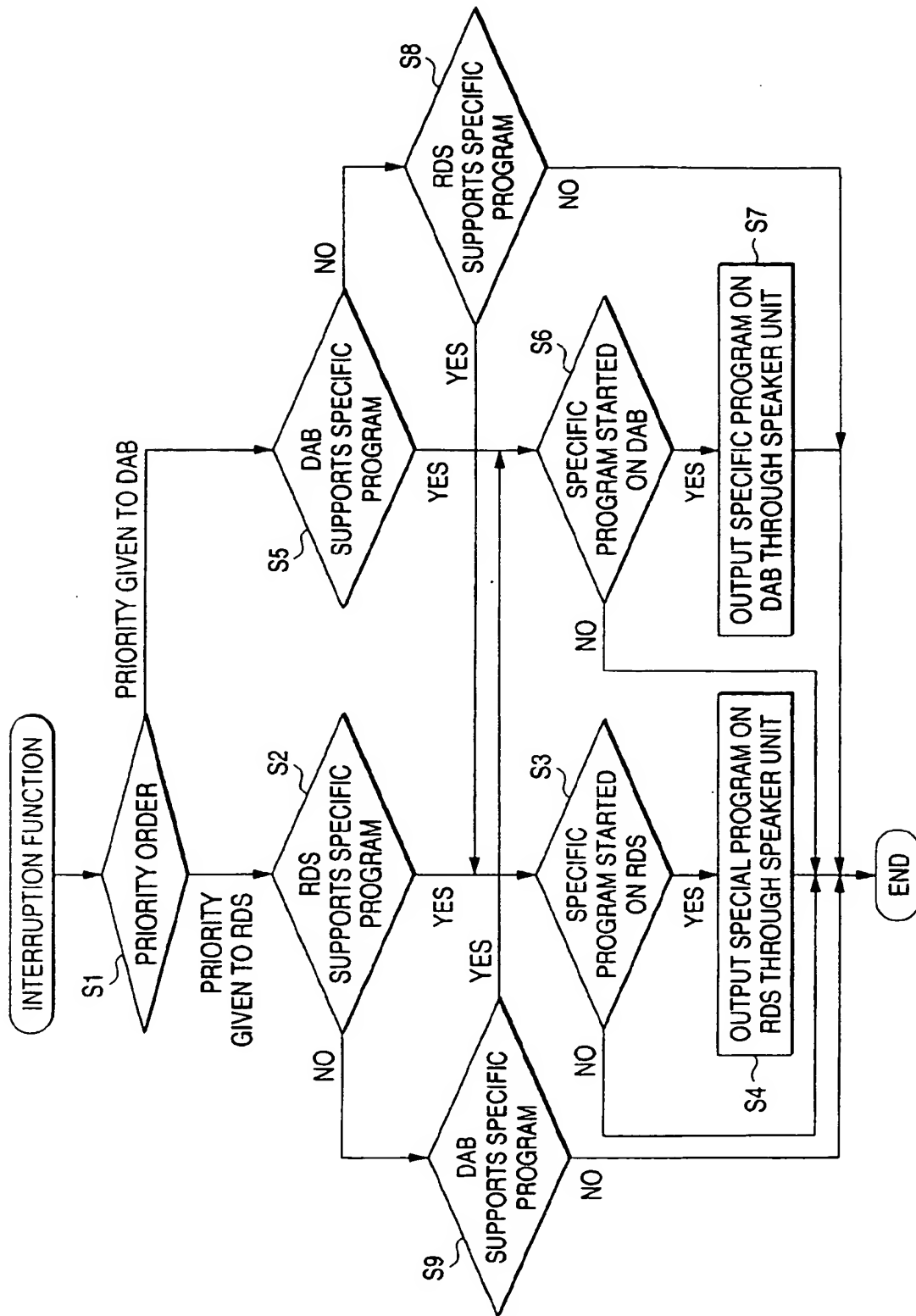
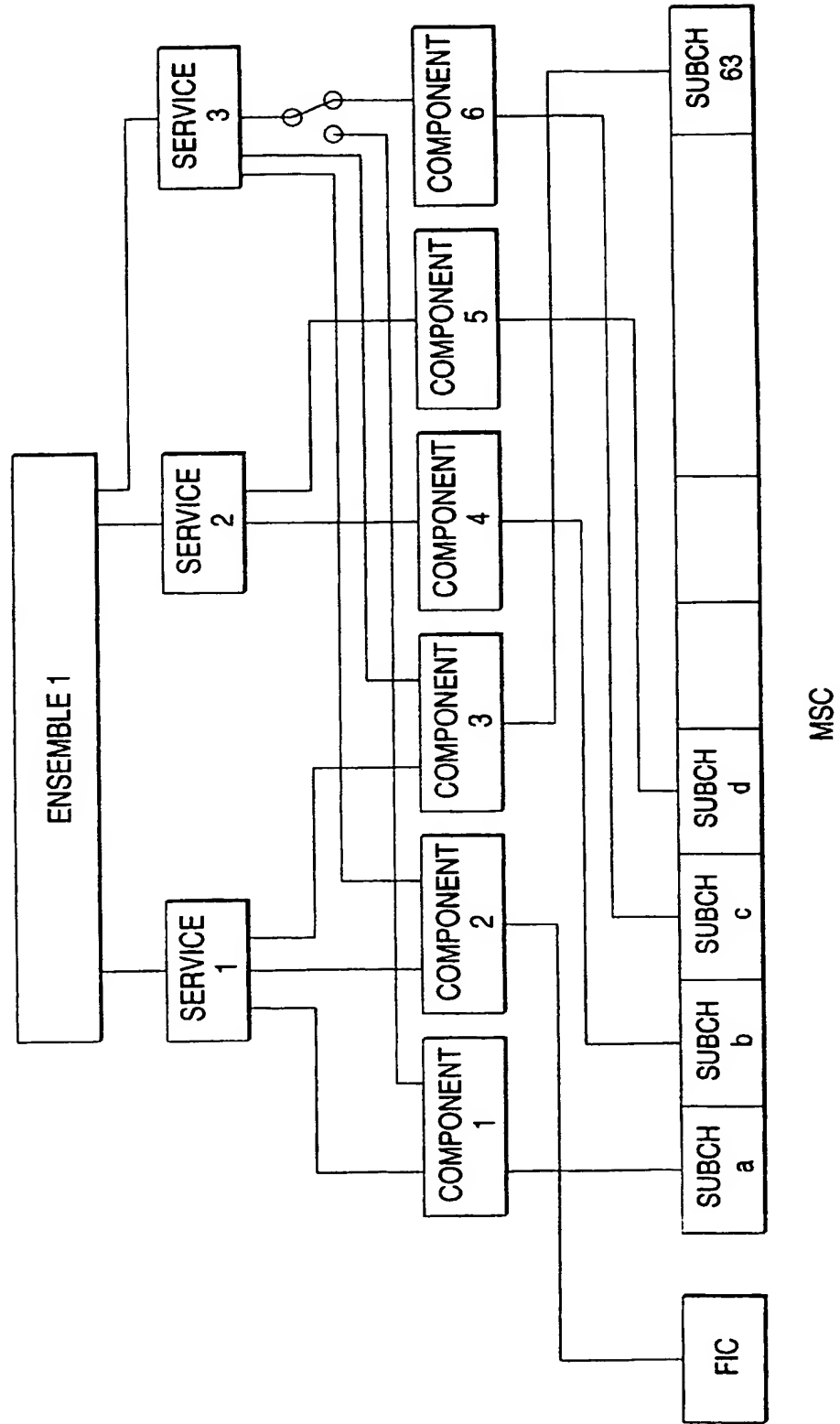


FIG. 3



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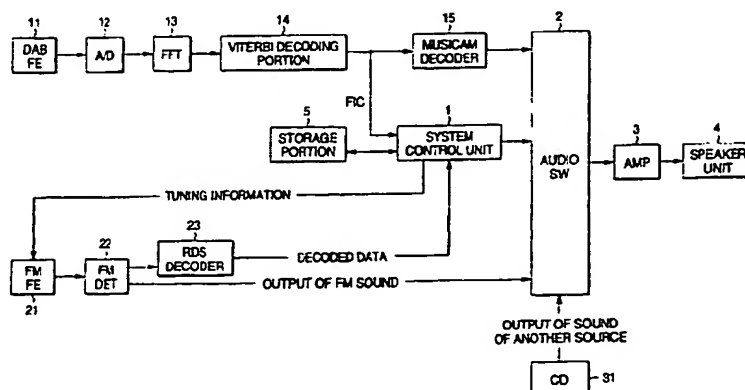
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a specific program which is broadcast by the RDS broadcast and the digital audio broadcast; and a control unit for giving priority to the specific program which is broadcast by the broadcast given a high priority order in accordance with a result of instruction made by the instruction means and the priority order so that the specific program is output.

FIG. 1



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European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 3248

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO 93 09615 A (TELEFUNKEN FERNSEH & RUNDfunk) 13 May 1993 (1993-05-13) * page 1, line 1 - page 9, line 22; claims 1,2; figures 1,2 *	1	H04H1/00
A	DE 41 36 068 A (TELEFUNKEN, FERNSEH UND RUNDfunk GMBH) 6 May 1993 (1993-05-06) * column 1, line 1 - column 3, line 66; claim 1; figure 1 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H04H
Place of search		Date of completion of the search	Examiner
THE HAGUE		2 March 2001	De Haan, A.J.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 30 3248

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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